

CLAIMS

What is claimed is:

- 5 1. A mass transit vehicle window installation assembly for simplifying and accelerating the installation of window assemblies in vehicle window apertures, the assembly comprising:

 a retainer configured to connect between a window assembly frame and a vehicle wall panel having a window aperture shaped to receive the window
10 assembly, where the window assembly frame [is configured to support a window assembly pane and] has a planform shape that generally complements that of the window aperture;

 the retainer being additionally configured to space such a window assembly frame from an inner peripheral surface of a complementary window aperture; and

- 15 the retainer being additionally configured to be supported on one of a window frame and a complementary window aperture in a position to center the window assembly as the window assembly is inserted into the aperture.

2. A mass transit vehicle window installation assembly as defined in
20 claim 1 in which the retainer is additionally configured to retain a window frame within a complementary window aperture.

3. A mass transit vehicle window installation assembly for simplifying and accelerating the installation of window assemblies in vehicle
25 window apertures, the assembly comprising:

 a plurality of window assembly retainers securable at spaced locations around and between a window frame and a window aperture;

 each retainer of the plurality of retainers being configured to connect
30 between a window assembly frame and a vehicle wall panel having a window aperture shaped to receive the window assembly, where the window assembly

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frame has a planform shape that generally complements that of the window aperture;

the plurality of retainers being additionally configured to space such a window frame from an inner peripheral surface of a complementary window aperture;

each retainer of the plurality of retainers being additionally configured to be supported on one of a window frame and a complementary window aperture in respective positions and to cooperatively center the window assembly as the window assembly is inserted into the aperture.

4. A mass transit vehicle window installation assembly as defined in claim 3 in which each retainer is additionally configured to retain the window frame within a complementary window aperture.

5. A mass transit vehicle window installation assembly as defined in claim 4 in which each retainer includes a spring clip configured to be fixed to a window frame and to snap outward into engagement with a recessed window aperture detent formed into an inside peripheral wall of a window aperture that is to receive the window frame.

6. A mass transit vehicle window installation assembly as defined in claim 3 in which at least one retainer of the plurality of retainers is configured to be fixed to an outer peripheral wall of the window frame.

7. A mass transit vehicle window installation assembly as defined in claim 6 in which:

at least one retainer includes a spring clip that includes an elongated resilient spring arm biased outwardly from a mounting base of the spring clip that attaches to the outer peripheral wall of the window frame; and

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the spring arm is configured to bend inwardly when contacting a front edge of a window aperture that the window assembly is being inserted into and then to spring back outward when the window assembly is fully inserted and an outer distal end of the spring arm passes over a recess defining the aperture detent, the distal end of the spring arm engaging the aperture detent once the spring arm has sprung back outward.

8. A mass transit vehicle window installation assembly as defined in claim 7 in which the spring arm of at least one retainer comprises an elongated strip of spring steel.

9. A mass transit vehicle window installation assembly as defined in claim 7 in which the distal end of the spring arm of at least one retainer includes a centering surface configured to engage an inner peripheral surface of a window aperture [to space the window frame a predetermined desired distance from an inner peripheral surface of a window aperture that the window assembly is inserted into, and to prevent the spring arm from springing too far outward and causing the distal end of the spring arm to pass and miss engagement with an aperture detent formed in the inner peripheral wall of the window aperture].

10. A mass transit vehicle window installation assembly as defined in claim 9 in which:

at least one retainer includes a spring arm that extends from a mounting base of the retainer in a direction that, when the retainer is attached to an outer peripheral wall of a window frame, is generally opposite the direction of window assembly insertion; and

the distal end of the spring arm includes an S-bend forming a detent surface that abuts a recessed window aperture detent formed into an inside peripheral wall of a window aperture that is to receive the window frame; and

the distal end also includes an adjacent outer tab that includes the centering surface for engaging an inner peripheral surface of the receiving window aperture.

11. A mass transit vehicle window installation assembly as defined in claim 9 in which at least one retainer includes a spring arm that extends from a mounting base of the retainer in a direction that, when the retainer is attached to an outer peripheral wall of a window frame, is generally the same as the direction of window assembly insertion, and the distal end is configured to hook over a back edge of the receiving window aperture to secure the window assembly against extraction opposite the direction of window assembly insertion.

12. A mass transit vehicle window installation assembly as defined in claim 4 in which at least one retainer comprises a spring clip including:
a mounting base configured to support the retainer on a window assembly frame; and
a spring arm extending from the mounting base and configured to bend inward toward the mounting base when a window assembly frame that the retainer is supported on is inserted into a receiving window aperture and the spring arm engages a front edge of the aperture, the spring clip being further configured to continuously bias a distal end of the spring arm outward against an inner peripheral surface of the aperture, the distal end of the spring arm being configured to engage the inner peripheral surface of the aperture in such a way as to provide an interference fit for the window assembly within the receiving window aperture.

13. A mass transit vehicle window installation assembly as defined in claim 12 in which:

at least one retainer comprises a spring clip having a spring arm that, when the retainer is supported on a window frame, extends from a mounting base of the retainer in a direction generally opposite the direction of window assembly insertion; and

the distal end of the spring arm includes a saw tooth edge configured to dig into an inner peripheral surface of the receiving window aperture to a depth sufficient to secure the window assembly against extraction from the window aperture opposite the direction of window assembly insertion.

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14. A mass transit vehicle window installation assembly as defined in either claim 1 or 3 in which:

the retainer includes a trim strip ring that approximates the outer planform shape of a window aperture and a complementary window assembly frame
10 configured to be installed in that window aperture;

the trim strip ring is configured to engage respective back surfaces of the window assembly frame and a wall panel that the aperture is formed in and to cover a gap formed between a peripheral outer surface of the window frame and a peripheral inner surface of the window aperture when the window frame is
15 installed in a window aperture in the wall panel.

15. A mass transit vehicle window installation assembly as defined in claim 14 in which the trim strip ring includes an elongated stem configured to be inserted in a gap formed between a peripheral outer surface of a window assembly
20 frame and peripheral inner surface of a window aperture receiving the window assembly frame.

16. A mass transit vehicle window installation assembly as defined in claim 14 in which the trim strip ring includes an elongated seal ring configured to prevent moisture and drafts of air from passing through a gap formed between a
25 peripheral outer surface of a window assembly frame and peripheral inner surface of a window aperture receiving the window assembly frame.

17. A mass transit vehicle window installation assembly as defined in
30 either claim 1 or claim 3 in which:

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the vehicle window installation assembly includes a window assembly frame having a front flange that extends outward from a main portion of the frame in a position disposed against a front surface of a wall panel that the window assembly is installed in;

- 5 the front flange covers the gap between the window frame and the inner peripheral wall of a window aperture that the window assembly is installed in; and
an elongated rubber seal ring is connected around and along a back surface of the front flange in a position to seal against the front surface of the wall panel.

- 10 18. A mass transit vehicle window installation assembly as defined in claim 7 in which the mounting base of the spring clip of at least one of the retainers includes a pair of radially extending diametrically opposed attachment ears configured to engage respective opposing lateral undercuts formed along opposite sidewalls of a groove formed around and outer peripheral wall of a window frame.

- 15 19. A mass transit vehicle window installation assembly as defined in claim 4 in which at least one of the retainers includes a spring clip configured to be supported on the window aperture and to engage a window assembly frame when the window assembly frame is inserted into a complementary window aperture.

- 20 20. A mass transit vehicle window installation assembly as defined in claim 4 in which at least one retainer of the plurality of retainers includes a spring clip configured to engage opposing channel side walls of a channel formed into and around an inner peripheral wall of a receiving window aperture.

- 25 21. A mass transit vehicle window installation assembly as defined in claim 20 in which the spring clip of at least one retainer includes a pair of legs that extend from a base element of the clip and are shaped to engage a pair of elongated flanges that extend inwardly from opposing channel sidewalls of a channel formed
30 into and around an inner peripheral wall of the window aperture.

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22. A mass transit vehicle window installation assembly as defined in claim 21 in which the legs of the spring clip of the at least one retainer have S-shaped bends configured to allow the legs to bend inward as the they are being pressed into a channel past flanges that extend inwardly from opposing channel sidewalls and then to snap back outwards into a position engaging the flanges and precluding extraction.

23. A mass transit vehicle window installation assembly as defined in claim 21 in which the legs of the spring clip of the at least one retainer are long enough to prevent the clip from falling into the channel or track without engaging the flanges.

24. A mass transit vehicle window installation assembly as defined in claim 21 in which:
the clip includes a resilient spring arm that extends diagonally from the base element of the clip in a direction generally opposite the direction intended for insertion of a window assembly frame;

the spring arm is configured to bend outwardly toward the inner peripheral wall of a window aperture that the clip is installed in when contacting a front edge of a window assembly frame that is being inserted into the window aperture.

25. A mass transit vehicle window installation assembly as defined in claim 24 in which a plurality of the spring clips are spaced around the inner peripheral wall of the window aperture so that a collective inward bias of the spring arms of the spring clips centers the window assembly in the window aperture upon insertion.

26. A method for centering and retaining a window assembly in a window aperture formed in a mass transit vehicle wall panel, the method including the steps of:

providing a vehicle wall panel including a window aperture;
providing a window assembly including a window assembly pane
supported around outer edges of the pane by a window assembly frame, the
window assembly frame having a general planform shape complementary to and
5 smaller than that of the window aperture;
supporting a window assembly retainer on one of the window assembly
frame and the window aperture; and
inserting the window assembly into the window aperture after supporting
the window assembly retainer on one of the window assembly frame and the
10 window aperture.

27. The method of claim 26 in which the step of providing a vehicle
wall panel includes providing a window aperture in the wall panel, the aperture
being at least partially defined by extruded structural channel having a recessed
15 detent formed into an inner peripheral surface of the window aperture.

28. The method of claim 26 in which:
the step of supporting a window assembly retainer includes providing a
window assembly retainer that includes a spring clip fixed to the window frame;
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the step of inserting the window assembly includes:
inserting the window assembly such that the spring clip is
compressed inward toward the window frame; and
inserting the window assembly until the spring clip snaps outward
25 into engagement with the aperture detent while remaining engaged against
an inner peripheral surface of the window aperture to both block the
window assembly movement in a direction opposite a direction of
installation and to space the window frame a desired distance from the
inner peripheral surface of the window aperture.

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29. The method of claim 28 in which:

the step of providing a wall panel includes providing a window aperture in the wall panel, the aperture being at least partially defined by a tubular structural member;

5 the step of supporting a window assembly retainer includes:

providing a window assembly retainer that includes a spring clip;
supporting the spring clip on the window frame; and

10 the step of inserting the window assembly includes inserting the window assembly such that the spring clip bends inward upon engagement with an outer edge of the window aperture as the window assembly is inserted into the window aperture and the spring clip continuously biases a distal end of the spring clip outward against the inner peripheral surface of the window aperture such that the distal end of the spring clip engages and provides an interference fit for the window assembly within the window aperture.

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30. The method of claim 26 in which the step of supporting a window assembly retainer on one of the window frame and the window aperture includes supporting a plurality of window assembly retainers at spaced locations around one of the window frame and the window aperture.

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31. The method of claim 26 in which the step of supporting a window assembly retainer on one of the window frame and the window aperture includes:

providing a retainer that includes a spring clip comprising a pair of diametrically opposed attachment ears;

25 inserting the ears into a groove formed around one of the outer peripheral wall of the window frame and the inner peripheral wall of the window aperture;
and

engaging the ears in respective opposing lateral undercuts formed along opposite sidewalls of the groove by rotating the spring clip.

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32. The method of claim 26 in which:

the step of providing a retainer includes providing a spring clip comprising a pair of legs shaped to engage and retain the clip between opposing flanges that extend inwardly from side walls of a channel formed into and around
5 the inner peripheral wall of the window aperture, and

the step of supporting a window assembly retainer includes inserting the legs into a channel formed around the inner peripheral wall of the window aperture until the legs engage the flanges.

10 33. The method of claim 26 in which the step of inserting the window assembly includes inserting the window assembly from a position outside a vehicle including the wall panel such that a front flange of the window frame rests against a front surface of the wall panel on the exterior of the vehicle with the window assembly in an installed position.

15 34. The method of claim 26 further including the step of installing a trim ring over a gap formed between a back edge of the window frame and a back edge of the window aperture on an interior of the vehicle.

20 35. The method of claim 34 in which the step of installing a trim ring includes snapping the trim ring into place.

25 36. The method of claim 26 in which the step of inserting the window assembly into the window aperture includes inserting the window assembly from a position inside a vehicle including the wall panel such that a front flange of the window frame rests against a back surface of the wall panel in the vehicle interior with the window assembly in an installed position.

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37. The method of claim 26 further including the step of installing a trim ring over a gap formed between a front edge of the window frame and a back edge of the window aperture on an exterior of the vehicle.

5 38. The method of claim 37 in which the step of installing the trim ring includes snapping it into place.

10 39. The method of claim 37 in which the step of installing the trim ring includes passing fasteners through the trim strip ring and into an existing groove that runs around the back surface of the window frame.

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